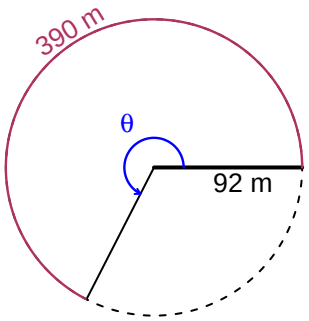
Name: Date:

Trig Final (SLTN v680)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 390 meters. The radius is 92 meters. What is the angle measure in radians?

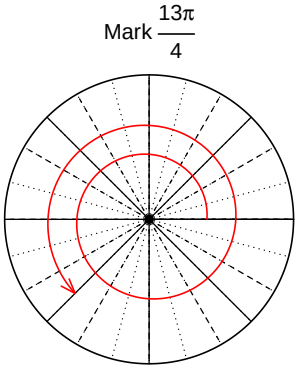


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

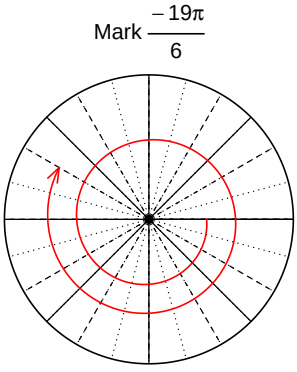
$\theta = 4.239$ radians.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-19\pi}{6}\right)$ by using a unit circle (provided separately).



Find sin(13π/4)



Find cos(−19π/6)

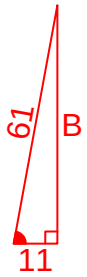
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-19\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-11}{61}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

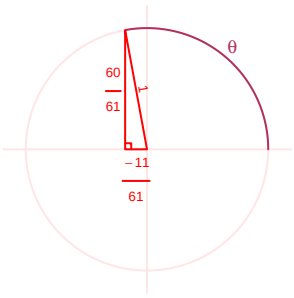
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$11^2 + B^2 = 61^2$$
$$B = \sqrt{61^2 - 11^2}$$
$$B = 60$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{60}{61}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.06 meters, a frequency of 4.51 Hz, and a midline at $y = 7.94$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.06\sin(2\pi 4.51t) + 7.94$$

or

$$y = 3.06\sin(9.02\pi t) + 7.94$$

or

$$y = 3.06\sin(28.34t) + 7.94$$